Livestock production systems management and stray dogs attacks in and nearby protected areas

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ABSTRACT

The incidence and the damage done by stray dog's attacks in sheep have economical impact in Beira Interior-Portugal. We pretend identify livestock management conditions that help to prevent stray dog's attacks.

The results are based on inquiries relative to 29.641 ha and 50.094 ruminants.

Main results:

-The percentage of milk or meat farms with attacks didn't differ (61 and 68%); different levels of attacks were observed in milking and non-milking flocks in the milk farms. Specific management conditions exist in the milking flock that originates a higher flock protection (human proximity, infrastructure, night protection);

-Livestock guardian dog (LGD) presence is dissuasive. Farms without LGD had more attacks (81,6% *vs*. 18,4%);

-Another relevant factor of attack incidence is the livestock grazing system: zero-grazing without attack; semi-transhumance with one accidental attack; 20% of flocks in pendulation and 77,9% of flocks in permanent grazing (continuous or rotational) have been attacked.

Special attention should be done to non-milking and meat flocks in order to assume specific protections solutions to reduce the damage (e-fence at night and LGD presence). The LGD presence gives better results, but should be complemented with other dissuasion mechanisms. The actual methods of stray dogs population control (shooting poison and sliding knots) affects wildlife carnivores and are especially negative nearby protected areas.

INTRODUCTION

Animal production in extensive or semi intensive production system strikes with several problems like dogs (stray, abandoned and loose) attacks to livestock.

Data show the relevance of this problem in the studied region: 62,8% of farms, 77,9% of the area, 76,1% of total livestock and 78,1% of the total sheep livestock suffered attack at least once during the 6 year time period covered by the study. In practical terms only 1/3 of farms didn't have problems with stray dogs attacks.

The conducted study aims to identify different animal handling techniques and the characteristics of the farms that can prevent stray dogs attacks in order to justify why some livestock did not suffered any attack during the referred period and others did, inclusively several times a year.

Other aim is to analyse the possible and main causes, related to the problem, specially the evaluation of handling conditions and the farm characteristics that can increase the number and the intensity of attacks.

MATERIAL AND METHODS

The presented data was based on 156 inquired farms, with the last actualisation done in 2007, distributed by 16 counties of the interior centre of Portugal.

The inquired farms represent:

- An area of 29.640,5 ha (within 2 and 1500 ha/farm);
- A total livestock of 50.094 animals (from 10 to 2000 animals/farms)
- Breeding Sheep numbers are 46.767 animals, allocated in 151 of the inquired farms (Table1).

Table 1 - General characterisation of areas, animals and altitude of the 156 inquired farms

	Inquired area (ha)	Total Sheep	Total S+C+G	Altitude (m)
Total	29.640,5	46.767	50.094,0	-
Average	190,0	299,8	321,1	537,8
[Min – Max]	[2-1.500]	[0-2.000]	[10-2000]	[168-1854]

Note: S- sheep; C – cattle; G - goat

Main methodological options:

- It was considered attack, whenever the presence of death/injured animals was registered;
- Situations of animal's dispersion associated to the disappearance without animal trace, was not considered;
- For data treatment, we had only considered livestock attacks done or attributed to stray dogs.

1. Attack incidence and production goal

The inquired farms (IF) present two main production goals: 73,7% produce milk and 26,3% meat.

From total attacks, 71,4% occurred in milk farms and 28,6% in meat farms; these numbers are proportional to the representativity of each farm production type on the IF.

Farm production goals (milk or meat) does not affect attack incidence. The results show that 60,9% of milk farms and 68,3% % meat farms suffered attacks (Table 2).

Table 2 - Attack incidence and dead and injured sheep in milk and meat farms (2002-2007)

	n IF	% of Total	FWA (%)	Sheep (D + I) % of Total	Sheep (D) by FWA	Sheep (D+I) by FWA	Sheep (D) by IF
Milk farms	115	73,7	60,9	74,7	27,5	34,9	21,3
Meat farms	41	26,3	68,3	25,3	26,3	29,6	20,2
TOTAL	156	100	62,8	100	27,2	33,4	21,0

Note: nIF – number of inquired farms; Farm with attack- FWA; Farm without attack - FNA

In milk farms there are two flocks, simultaneously, mostly of the year:

- The milking flock - including lambed, weaning and daily milked animals;
- The dry flock - including breeding, pregnant and out of milking animals.

Stray dog's attacks affect differently the two flocks; attacks incidence is 10% in milking flock and 90% in dry flock (Table 3).

Table 3 - Attacks distribution in milk farms (milking flock and dry flock) and meat farms with attacks by production goal.

		n FWA	FWA in IF (%)	FWA (%)	Sheep (D + I) in FWA	Sheep (D) in FWA
Milk	Milking Flock	7	6,1[a]	10[a]	1,2[a]	0,9[a]
	Dry flock	63	54,8[b]	90[b]	33,8[b]	26,6[b]
	Total	70	60,9	71,4	34,9	27,5
Meat		28	68,3	28,6	29,6	26,3
Total		98	62,8	100	33,4	27,2

In milk farms that suffered attacks (60,9% of the IF), 6,1% of the attacks occurred in the milking flock and 54,8% in the dry flock.
Comparing milk and meat farms, data shows that the incidence of attacks is similar in meat farms and in the dry flock of milk farms (54,8% and 68,3%).

In the studied period (2002-2007), the number of dead sheep in stray dogs attacks, is similar in milk and meat farms (27,5 and 26,3 dead sheep by farms WA; 34,9 and 29,6 dead or injured animals by farm WA; 21,3 and 20,2 dead and injured sheep by IF (Table 2 and 3).
However significant differences were found between the two flocks of milk farms concerning dead sheep, and dead and injured sheep.
In the milking flock submitted to stray dogs attacks, a low number of dead and injured sheep were found: for the studied period the average numbers are 0,9 dead and 1,2 dead or injured sheep by Farm WA.

In dry flocks the number of dead and injured animals rises up to 26,6 and 33,8 respectively with significant differences to the results of the milking flock but similar to the ones observed in meat farms (26,3 dead sheep and 29,6 dead and injured sheep by farms WA).
Considering the obtained results we can state that the incidence of attacks and the number of dead and injured sheep is similar in meat farms and in dry flock of the milk farms, but significantly different to the milking flock of the milk farms. The justification lays on the differences on the animal handling which is used in the two groups of animals

- The milking flock is milked twice a day, the presence of the shepherd is usual, stays overnight nearby the milking parlour in a ”bardo” or are kept inside a house; this flock is the one that stays close to the milking parlour and grazes nearby;
- The dry and the meat production flock are usually in permanent or rotational grazing, stays overnight in the fields without night protection and are not accompanied daily by a shepherd.

The results are accordingly to the animal handling differences and can be due to:

- Higher infrastructure proximity, human and livestock guardian dog presence;
- Overnight protection.

With these conditions the incidence of attacks is lower as well as the animal damages.

2. Attacks incidence and LGD presence in the farms

Domestic dogs, distributed by the categories of livestock guardian dog, company dog, herding dog, hunting dog and guardian dog are present in 84% of the farms. Data shows that 75,5% of farms WA have dogs; however, only 1,7% of farms without attack (FNA) do not have dog (Table 4).

Table 4 - Presence of dogs in the inquired farms

	n IF	Farms with dog	Farms without dog
FWA	98	75,5	24,5
FNA	58	98,3	1,7
Total	156	84,0	16,0

Note: n IF – number of inquired farms; Farm with attack- FWA; Farm without attack - FNA

Shepherd dogs and livestock guardian dogs are present in about half of the inquired farms: 59,0% and 51,3% respectively (Table 5).

Table 5 - Presence of shepherd dog, herding dog and livestock guardian dog in inquired farms

	n IF	Shepherd dog		Herding dog		Livestock guardian dog	
		with	without	with	without	with	without
FWA	98	43,9	56,1	15,3[a]	84,7[b]	36,7[a]	63,3[b]
FNA	58	84,5[b]	15,5[a]	25,9[a]	74,1[b]	75,9[b]	24,1[a]
Total	156	59,0	41,0	19,2	80,8	51,3	48,7

Note: nIF – number of inquired farms; Farm with attack- FWA; Farm without attack - FNA

Livestock guardian dogs are present in 36,7% of the farms that suffered attacks and in 75,9% of the farms that didn't suffered attacks. About 63% of the farms attacked didn't have livestock guardian dogs and this fact seems to be favourable for the occurrence of attacks.
The evaluation of attack incidence, in farms with and without livestock guardian dogs, shows that 45% of the farms with dogs suffered and 55% didn't suffered attacks (Table 6).

Table 6 - Distribution of farms with and without attack according to the presence or absence of LGD

	n IF	%	FWA	FNA	Total
Farms with LGD	80	51,3	45,0	55,0	51,3
Farms without LGD	76	48,7	81,6[b]	18,4[a]	48,7
Total	156	100,0	62,8	37,2	100,0

Note: nIF – number of inquired farms; Farm with attack- FWA; Farm without attack - FNA

In farms without livestock guardian dogs, 81,6% suffered attacks and only 18,4% didn't (Table 6).

Analysing the results it seems evident that the presence of LGD is favourable since the incidence of attacks is lower. Deepening the analysis we verify that in farms with LGD, the

farms that suffered attacks have an average number of dogs superior than the farms without attack (2,72 and 2,23 respectively). Nevertheless, the average area of farms is higher (258,5 ha *vs* 114,1ha) as well as the average number of sheep (416,6 *vs* 205,5). This means that in farms WA one dog is responsible for 153,1 sheep and covers an average area of 95 ha; in farms NA these numbers change to 92,3 sheep by dog in an average area of 51,2 ha (Table 7).

Table 7 - Attacks incidence in farms with and without LGD and farms characteristics.

	n		Farms WA	Farms NA	Total
Farms with LGD	80	n.º Farms	36	44	80
		% Farms	45,0	55,0	51,3
		LGD/ Farm	2,72	2,23	2,45
		Average area	258,5[b]	114,1[a]	179,1
		Average sheep livestock	416,6 [b]	205,5[a]	300,5
		Area/Dog (ha)	95,0 [b]	51,2 [a]	73,1
		Sheep/Dog	153,1 [b]	92,3 [a]	122,7
Farms without LGD	76	n. º Farms	62	14	76
		% Farms	81,6	18,4	48,7
		Average area (ha)	222,2 [b]	109,9 [a]	201,5
		Average sheep livestock	347,5 [b]	84,1 [a]	299,0
TOTAL	156	n. º Farms	98	58	156
		% Farms	62,8	37,2	100
		LGD/ Farm	1,00	1,69	1,26
		Average area (ha)	235,5	113,1	190,0
		Average sheep livestock	372,9	176,2	299,8
		Area/Dog (ha)	235,5	66,9	151,2
		Sheep/Dog	372,9	104,3	238,6

Smaller flocks have fewer attacks because the flock is handled as a whole, the grazing system is different and the dog became more efficient.
In medium and large milk farms the flock is divided into two groups (milking and the dry flock); the milking flock is the one that suffers few attacks because it is usually accompanied by a shepherd and dogs. In these farms the presence of more LGD is not the solution to overcome stray dogs attacks; other mechanisms of defence like overnight in electrified "bardo" should be implemented.

In meat farms that suffered attacks (68,3%), data, clearly show the advantage of the presence of LGD: 46,2% of the farms with LGD suffered attacks and in farms without LGD this number rises up to 78,6% (Table 8).

In meat farms the average number of LGD is 1,8 in farms with attack and 1,4 in farms without attack. Nevertheless the variables, average area per farm (623,8 ha WA and 189,9 ha NA), average livestock (632,3 and 86,9), average area/dog (339,9 ha and 132,9 ha) and sheep/dog (344,9 and 60,8) are much superior in farms with attack than in farms that didn't suffered attacks.

Table 8 - Attacks incidence in farms with or without dogs accordingly to the main production system.

			n IF	FWA (%)	FNA (%)
Farms with LGD	Milk	Milking	67	3,0	55,2
		Dry		41,8	
	Meat		13	46,2	53,8
Farms without LGD	Milk	Milking		10,4	16,7
		Dry		72,9	
	Meat		28	78,6	21,4
Total	Milk	Milking	115	6,1	39,1
		Dry		54,8	
	Meat		41	68,3	31,7
Total Farms			156	62,8	37,2

Note: nIF – number of inquired farms; Farm with attack- FWA; Farm without attack - FNA

The most immediate and cheaper solution in order to reduce the incidence of stray dogs attacks, in meat farms, is the introduction of LGD in farms that still do not have these animals (68,3%) and raise the number of dogs in large farms. However proper dog training and handling is an imperative.

3. Incidence of attacks and grazing systems

Data shows significative differences in attack incidence according to predominant grazing system.
Pendulation is characterised by a low incidence of attacks (19,2 vs 80,8% of farms WA and NA respectively). On the other way permanent and rotational grazing is associated with higher incidence of attacks (77,9 *vs* 22,1% of farms WA and NA) (Table 9).
Farms with several grazing systems (pendulation, permanent and rotational) present intermediate values.

Table 9 - Incidence of attacks according to the grazing system

	Total (%)	FWA (%)	FNA (%)
Permanent and rotational grazing	55,5	77,9	22,1
Permanent and rotational grazing + pendulation	27,7	60,5	39,5
Pendulation	16,8	19,2	80,8

Note: n IF – number of inquired farms; Farm with attack- FWA; Farm without attack - FNA

Farms with permanent and rotational grazing system represent 55,5% of the total farms, 75,0% from total sheep livestock and 82,4% from the total inquired area; the average area per farm is 284,0 ha, the average number of sheep is 406,8, heading 1,43 sheep/ha.
Farms with pendulation grazing system represent 16,7% of the total farms, 6,8% from total sheep livestock and 4,3% from the total inquired area; the average area per farm is 40,4 ha, the average number of sheep is 121,8, heading 2,52 sheep/ha (Table 10).

Table 10 - Farm characteristics according the grazing system

	Farm characteristics	With LGD	Without LGD	Total
Permanent and rotational grazing	% of Farms	32,6	67,4	55,5
	Average area	362,8	246,0	284,0
	Average sheep livestock	525,5	349,6	406,8
	Area/dog (ha)	147,2	---	---
	Average sheep livestock/dog	213,3	---	---
	Dogs/farm	2,46	---	0,80
	Sheep/ha	1,45	1,42	1,43
Permanent and rotational grazing + pendulation	% of Farms	67,4	32,6	27,7
	Average area	104,6	65,8	91,9
	Average sheep livestock	224,1	144,2	198,1
	Area/dog (ha)	38,4	---	---
	Average sheep livestock/dog	82,3	---	---
	Dogs/farm	2,72	---	1,84
	Sheep/ha	2,15	2,19	2,16
Pendulation	% of Farms	84,6	15,4	16,7
	Average area	51,6	30,8	40,4
	Average sheep livestock	124,4	107,8	121,8
	Area/dog (ha)	24,7	---	---
	Average sheep livestock/dog	59,5	---	---
	Dogs/farm	2,09	---	1,77
	Sheep/ha	2,41	3,50	2,52

In what concerns area and handling livestock, farms are quite different. Farms with pendulation compared with farms with permanent and rotational grazing present:

- Less area (14,2%);
- Less livestock (29,9%);
- More farms with LGD (84,6 *vs* 32,6%)

resulting in a lower attack incidence. However in farms with grazing systems the human presence seems to be one of the main factors in the attack prevention.

CONCLUSIONS

The incidence of stray dog's attacks to livestock (mainly sheep livestock) is influenced by several variables, namely the primary production goals (milk or meat), presence or absence of LGD and the grazing system adopted.
The large dimension of farms and the diminishing of human presence nearby the flocks are the most important factors that boosts the incidence and the strength of the attacks.
It is possible to identify two methodologies used in order to prevent stray dog's attacks:
to use LGD and to keep sheep safe, either by protecting the field where they spend the night or keep them inside the sheep house.
The presence of LGD is efficient, though the results obtained show that it must be complementary with other dissuasive methods.
The dog's efficiency depends upon its socialization and handling. In some farms the behaviour of the LGD is alike to the shepherd dog behaviour, meaning that the LGD instead of staying with the flock goes with the shepherd.
For instance, in milk farms the dog stays with the shepherd, guarding the milking flock while the dry flock grazes without protection in the field.
Many of these flocks suffer several attacks by year which affects their productivity (either by the loss of animals either by the decrease in production) and also create severe stress situations causing fear reactions to the presence of dogs which blocks or difficult the action of LGD in guarding these flocks.
Keeping animals inside the sheep house during the night is not always functional and it raises other types of problems and costs. Whenever this is not possible the utilization of electric fences and electrified "bardo" are pertinent solutions, though they involve higher production costs (equipment, materials and labour). For flocks that don't accept the presence of LGD these prevention methods are an interesting and rational solution.

The dimension of the farm seems to be determinant in the incidence of stray dogs attacks. The incidence of attacks according to the dimension of the farms is similar in farms with areas less than 80 ha, but varies significantly for areas above 80 ha with the higher amplitude being reached in farms with more than 401 ha (87,5 % suffered attacks and only 12,5% didn't suffer any attack).
Dimension is the most important farm characteristic that enables dog's attacks.
Due to human activities (not related to animal production) some periods of the year are crucial because the number of attacks rises significantly. Understanding and act upon these human activities is the best way to prevent attacks.

The crucial periods for attack incidence are:

- Vacations (end of July to the end of September) due to the abandon of dogs and the absence of people that usually feeds them. This situation is particularly important in rural areas close to small and medium towns;
- Hunting period, beginning in September/October (for the majority of species hunted with dogs) and ending in December/January. During this hunting period some dogs get lost and others are abandoned because they do not have enough hunting skills.

Data reveals that 66% of the attacks occur in a six-month period (August/January) with an average of 11% attacks per month. In the other semester occur 34% of total attacks with an average of 5,5% attacks monthly.
From February to June, the number of attacks decreases and it rises again from July to January. Defence mechanisms must be reinforced during this period of time.

This need is stressed if we consider that in most farms the employees have vacations in August and September and many farms adopt mix animal production systems where vegetal production roles an important part with harvesting occurring in October /November.
During these months (or partly) there is a decrease of the human presence nearby the flocks and this condition improves the probability of stray dog's attacks.
Based on farm characteristics and on the factors that may improve attack incidence, solutions must be identified according to:

1- Type of flock – meat or milk (dry and milking flocks);
2- Presence and number of LGD – ratios area/dog and sheep/dog;
3- Dog's skills;
4- Grazing system.

And as well to:
5- Farm dimension;
6- Human presence near the flock;
7- Period of the year;
8- Proximity of urban areas;

The study area includes and is surrounded by protected areas. If we want that wild species (predatory species like wolf and other carnivores or game species) do territorial reoccupation, besides the payments to cover losses it is also necessary to find solutions to minimize livestock damages.
Prevention methods yearly referred associated to an efficient program of dog collect in rural areas should enable a reduction of gun shooting, which is the principal method of dog population control, and prevent the use of other methods like poison and sliding knots (used but not assumed) which are particularly prejudicial to the wild life specially carnivore and scavenger species.

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